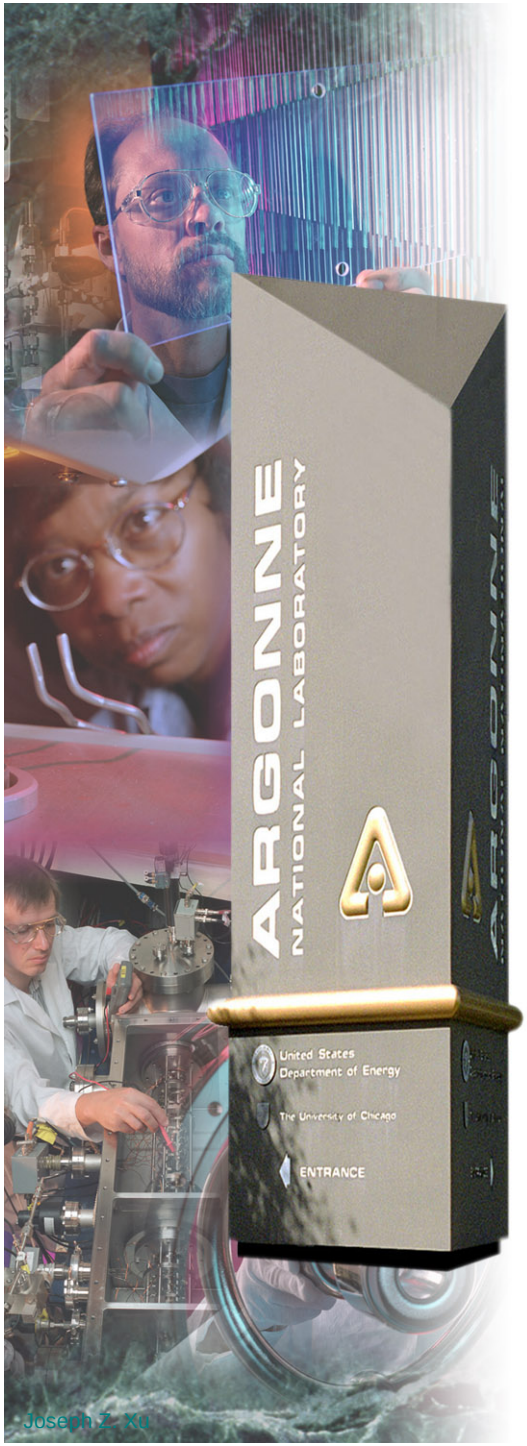

EPICS-LabVIEW Integration Discussion

Joseph Z. Xu

APS CTLS

Argonne National Laboratory

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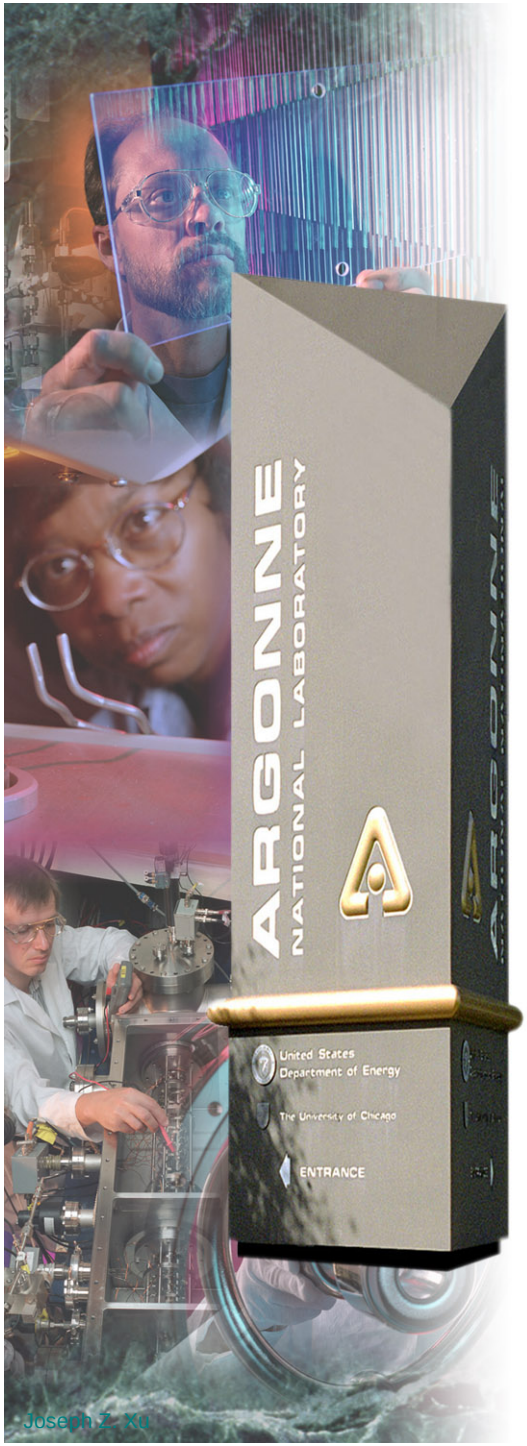
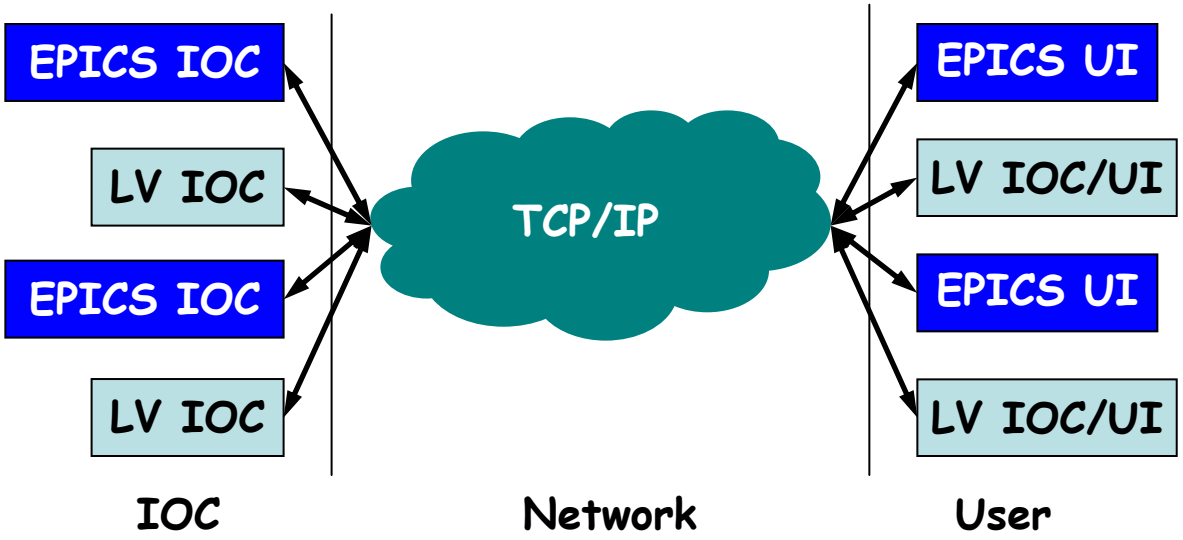
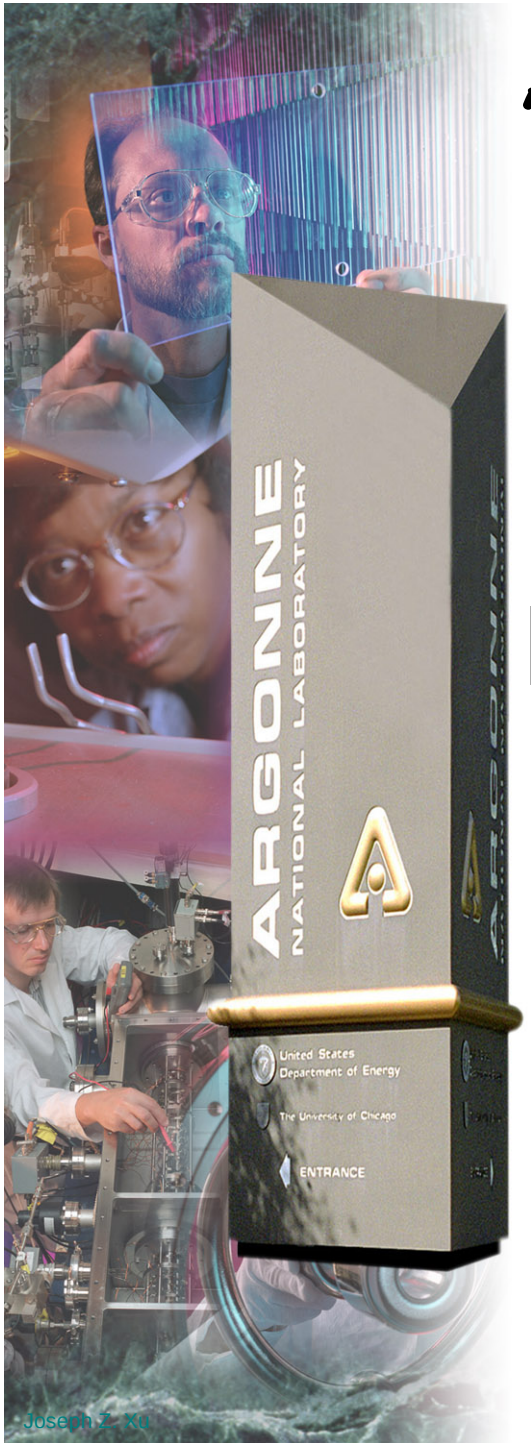


EPICS-LabVIEW (LV) Needs



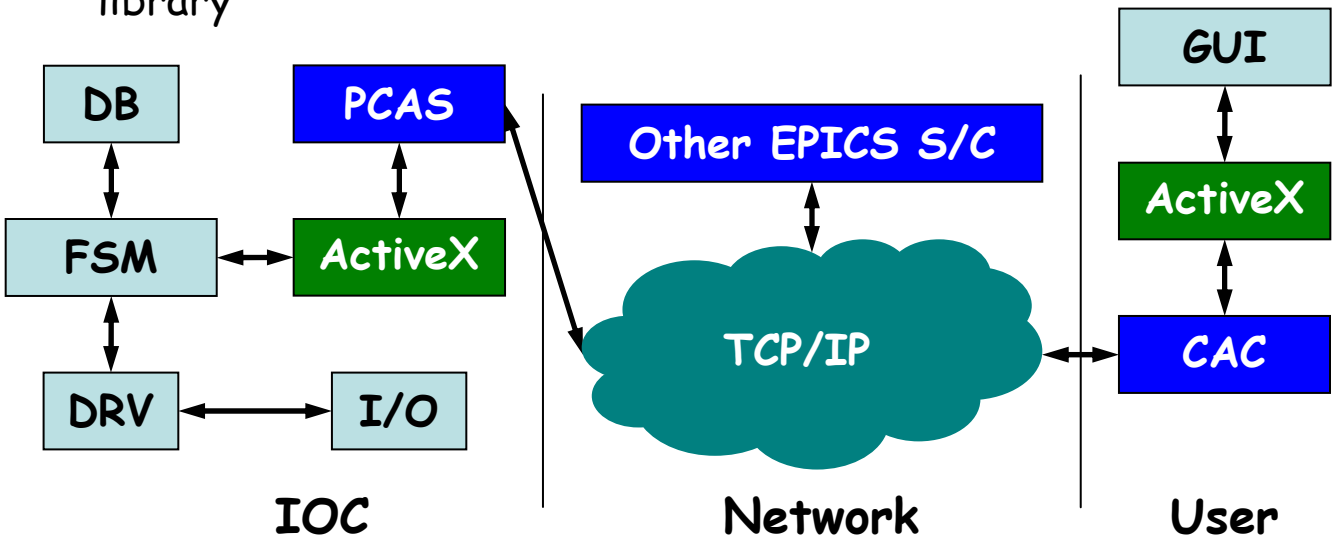
- LabVIEW IOC/UI: End user LabVIEW IOC that needs to interface with EPICS IOCs.
- LabVIEW IOC: Ad-Hock (PXI) IOC running LabVIEW, "touches and feels" like an EPICS IOC.
- LabVIEW based Control System (CS) with EPICS scalability.



ActiveX EPICS-LabVIEW Interface

Developed by Kay-Uwe Kasemir at the LANL, this interface

- Conforms the EPICS CA library to ActiveX interface.
- Uses LabVIEW's ActiveX interface to access the EPICS CA library



FSM: LabVIEW FSM
GUI: LabVIEW GUI
PCAS: Portable CAS

CAC: Channel Access Client
: LabVIEW Dev Module
: ActiveX Module

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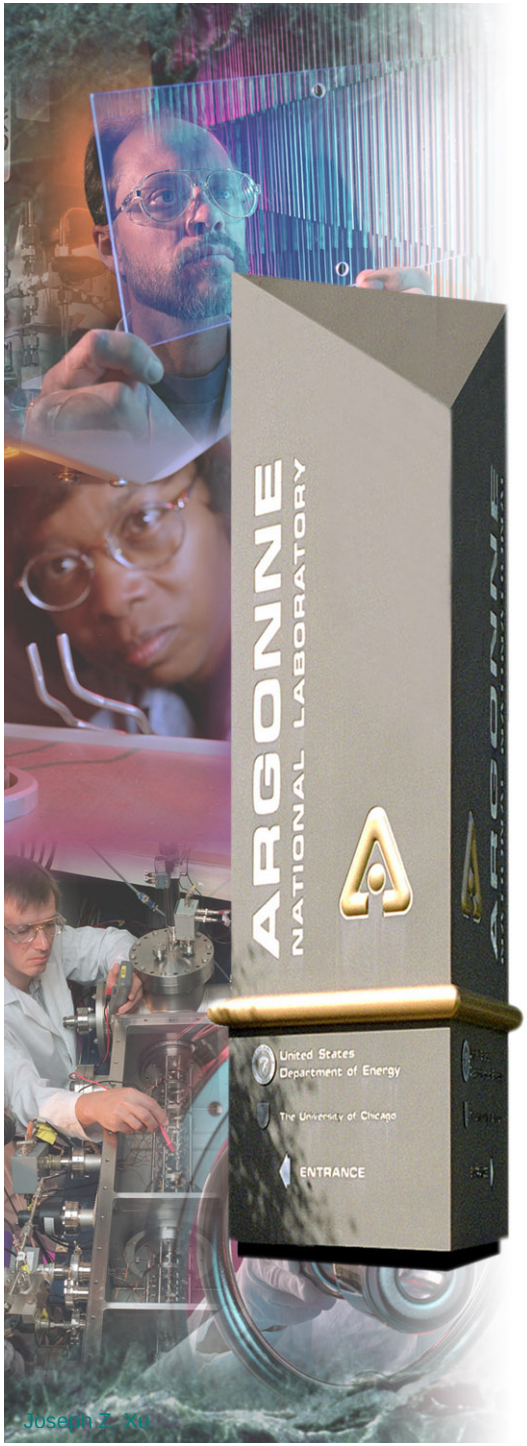


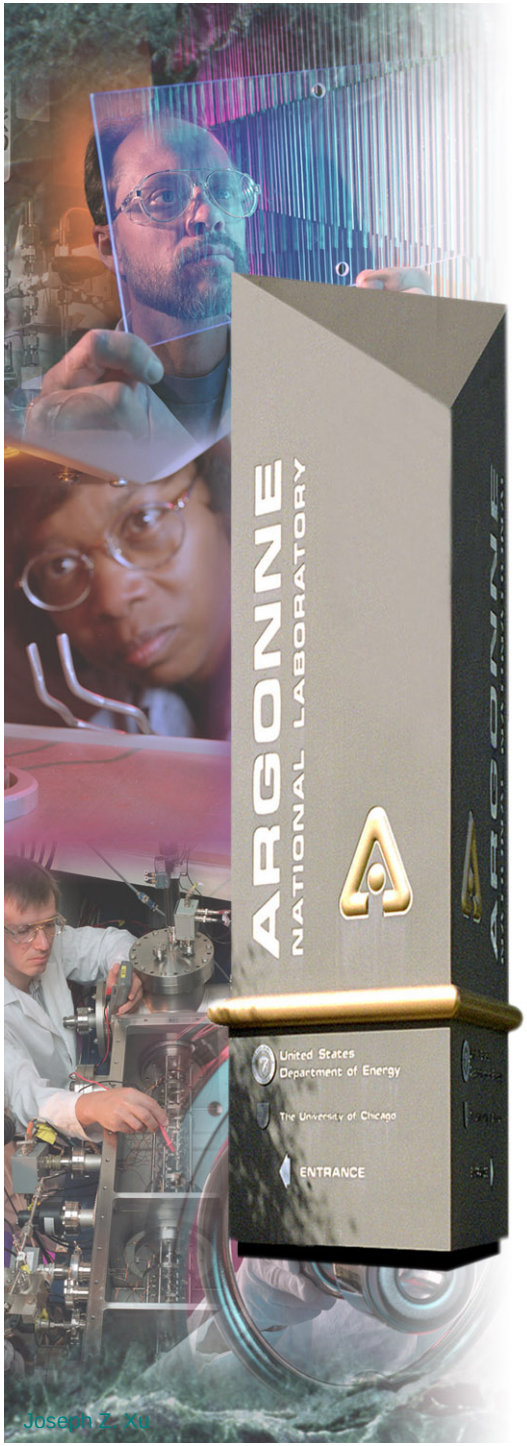
It provides...

- Easy access to LabVIEW data via PVs over CA without a whole lot of EPICS.

  In LabVIEW, using PVInit.vi, PVConfig.vi, PVSet.vi, PVCheck.vi, …, and PVClose.vi to initialize, configure, set, check, and close a PV.

- PVs can be created and destroyed dynamically.
- Each PV has the following configurable attributes:

  PV Name; Value; Data type (unit); Precision; Control, Warning, Alarm, and Graphic HIHI/LOLO.



Users all across the globe

- ALS, LBNL
- APS, ANL
- CEA-CNRS CEA-Saclay (France)
- Duke Univ.
- GSI (Germany)
- Italian National Nuclear Physics Institute (Italy)
- LEDA, LANL
- New Mexico State Univ.
- NSLS, BNL
- SLAC
- Synchrotron Laboratory at Barcelona (Spain)

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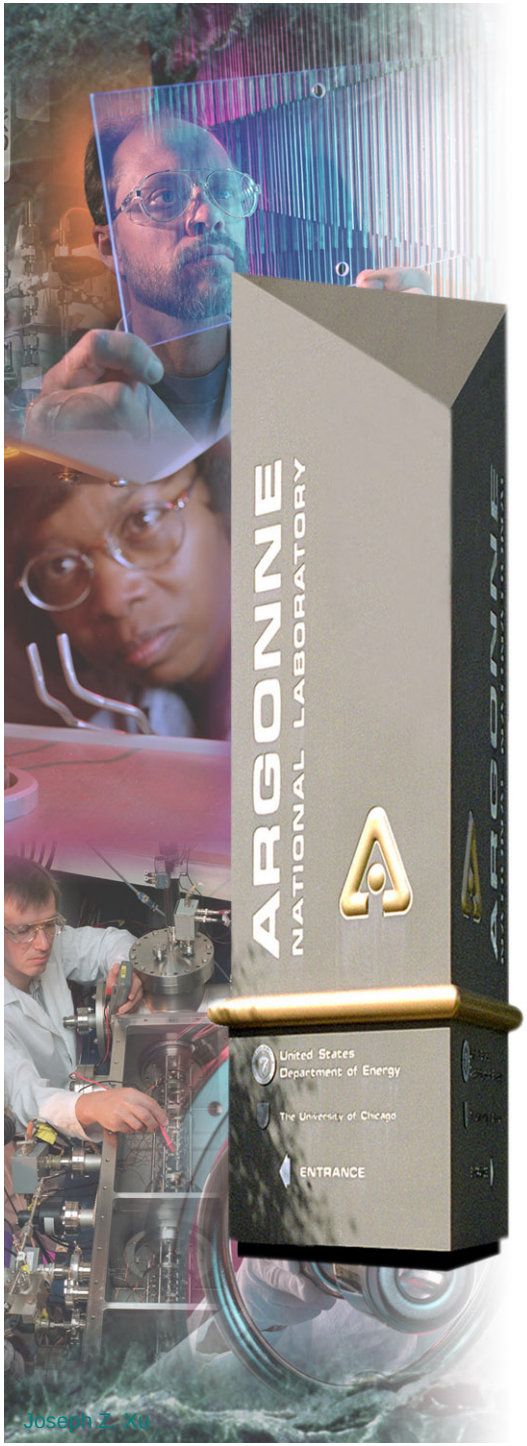
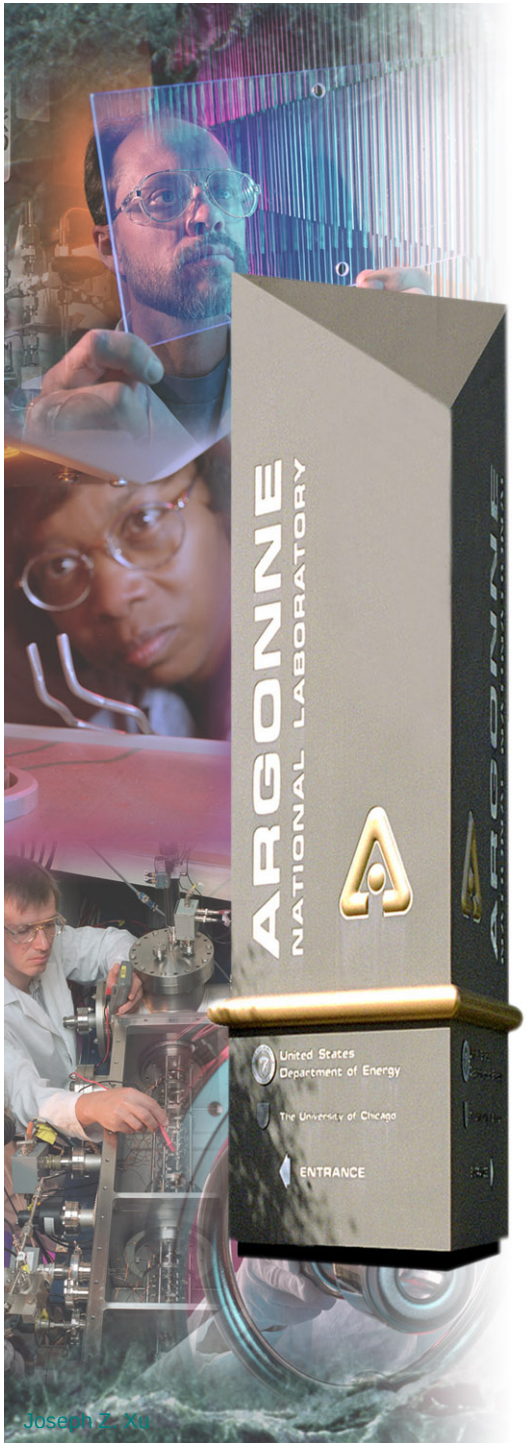


What people like

- Simple to use interface.
- Easy access to EPICS PVs from LabVIEW systems.
- Don't have to know a whole lot of EPICS to use the interface.
- Don't have to know C/C++ to program.



Issues

Limited PV Num:

- Limited to 32.

PV Attributes:

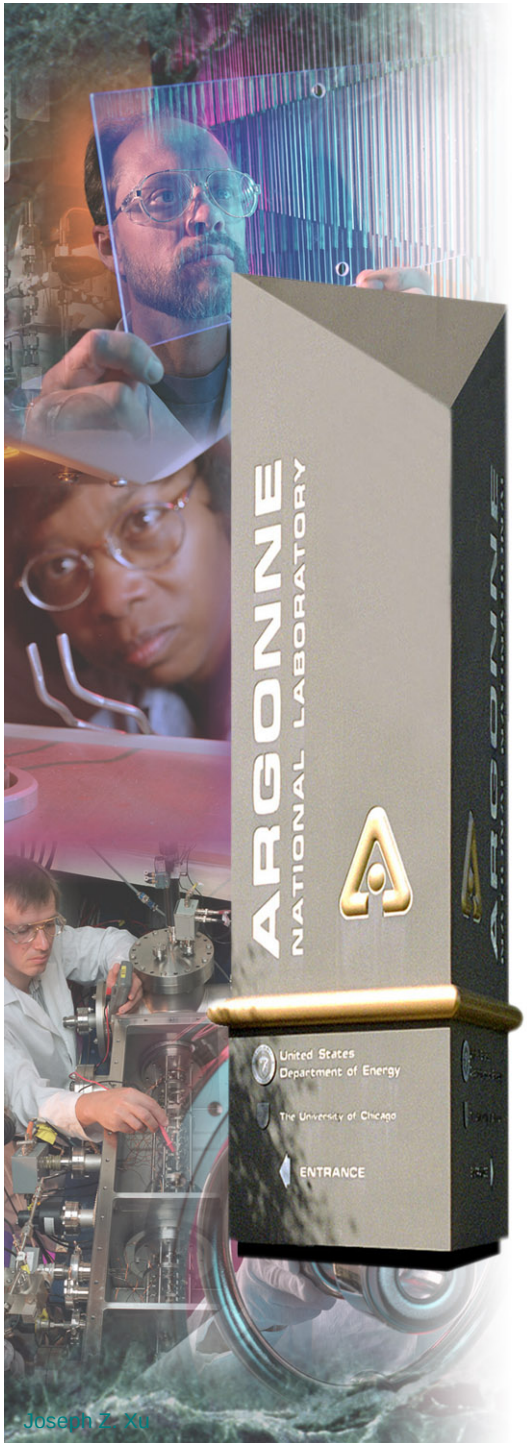
- Doesn't support full attributes.

Event/Interrupt:

- Only support "Polling" mechanism.
- Doesn't support PV asynch call-backs.

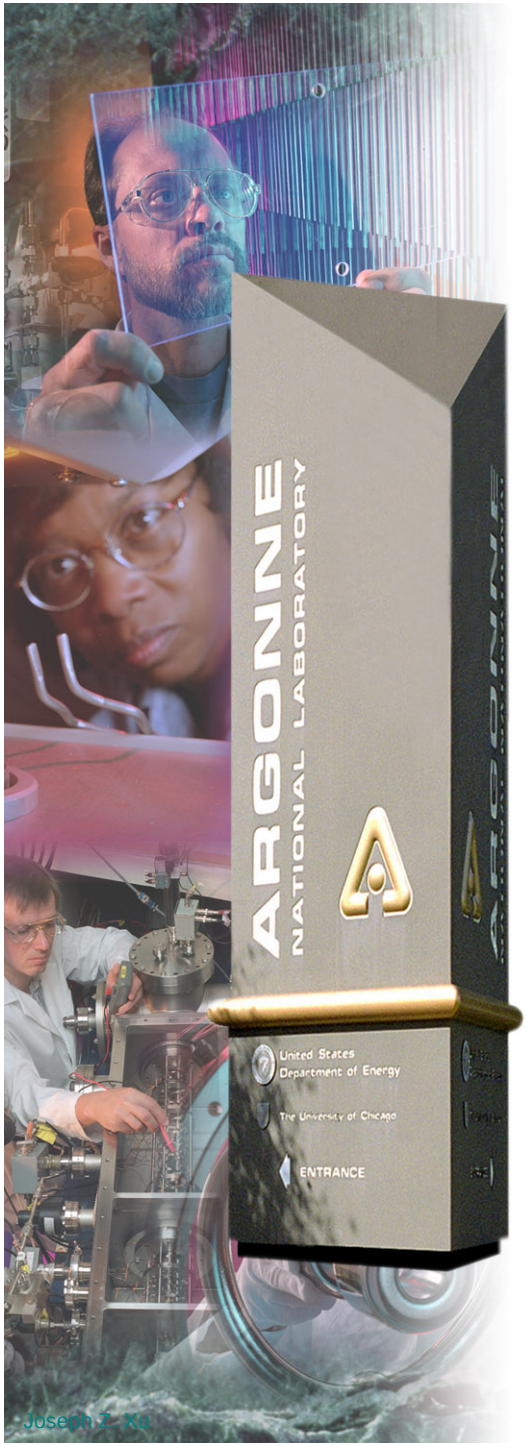
Performance:

- Asynch get/put: 0.04ms/0.17ms
- Synch get: 63ms.



Additional features wanted

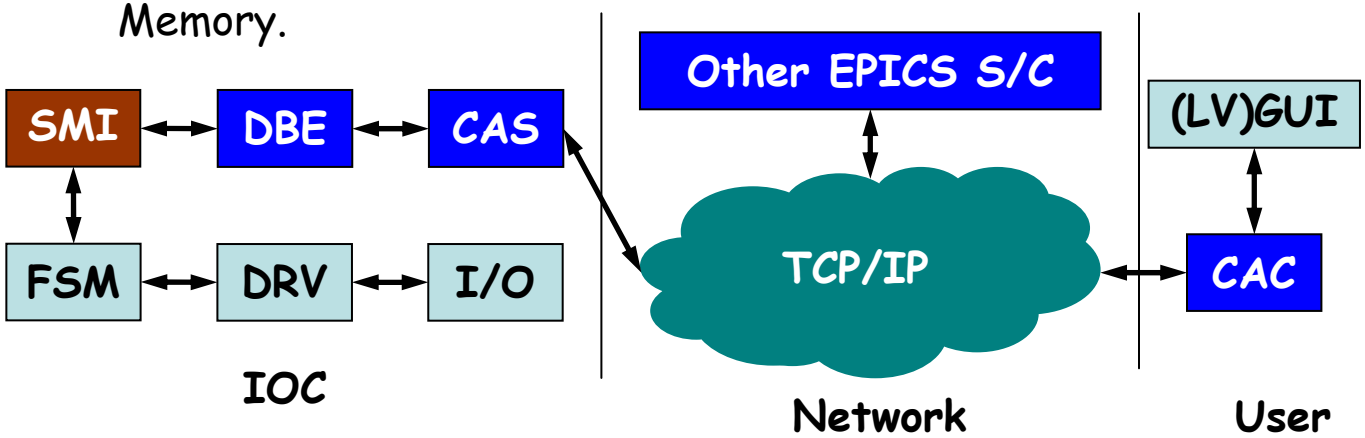
- Support full PV attributes
- Alarm states.
- Event timestamps consistent with other IOCs.
- Time synchronization with EPICS time server.
- PV bundling.



EPICS Shared Memory CAS/CAC

Developed by Dave Thompson and Willem Blokland at the SNS, this approach

- Adds an access interface to the standard EPICS records via device support using Shared Memory. (SM.dll library calls).
- Links LabVIEW variables to EPICS PVs via the Shared Memory.



FSM: LabVIEW FSM
DBE: Data Base Engine
GUI: LabVIEW GUI
DB: Data Base Records

: LabVIEW Dev Module

: Share Memory Interface

DB: Data Base Records

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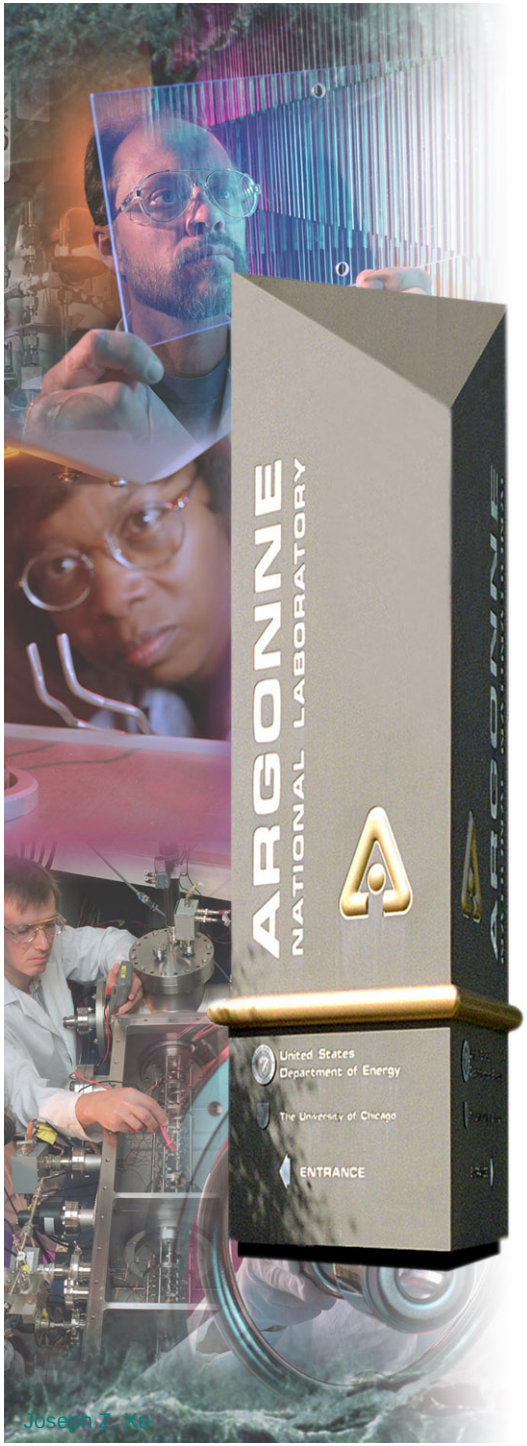


It has the full feature of EPICS

- Almost all the capabilities of an iocCore.

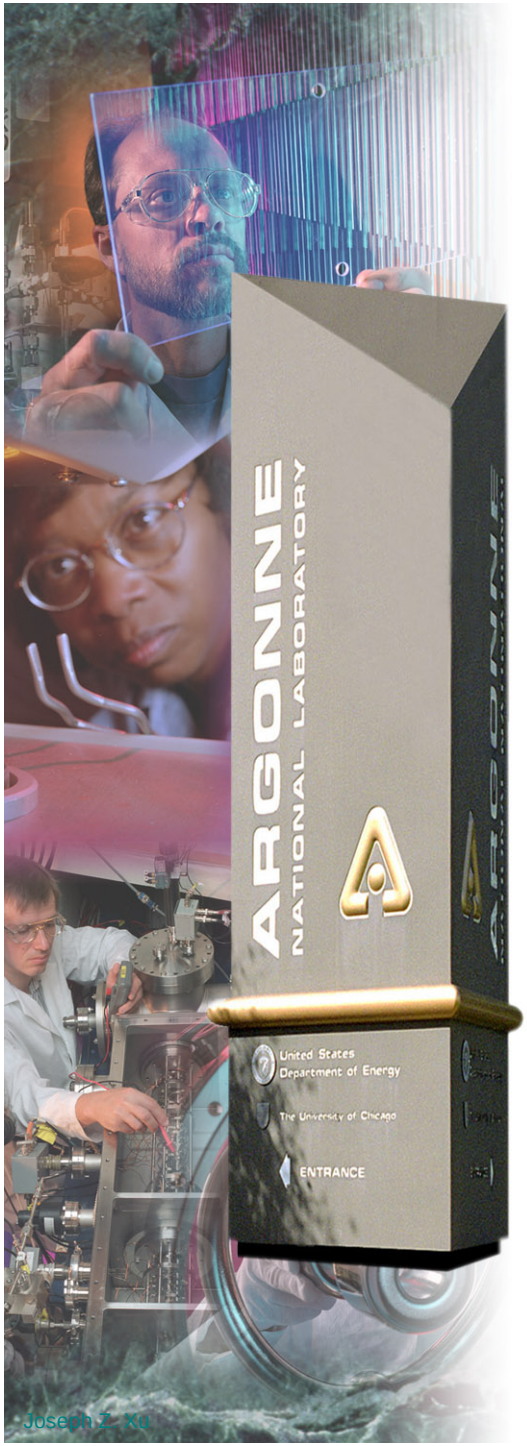
  Start the EPICS IOC by running epicsSM.exe with st.cmd as an argument.

- iocCore functionality using Shared Memory and LabVIEW as "device support"

  In LabVIEW, using SM_Get.vi, SM_Set.vi, SM_Interrupt.vi, …, and SM_Utility.vi to get, set, and configure the values of an EPICS PV.

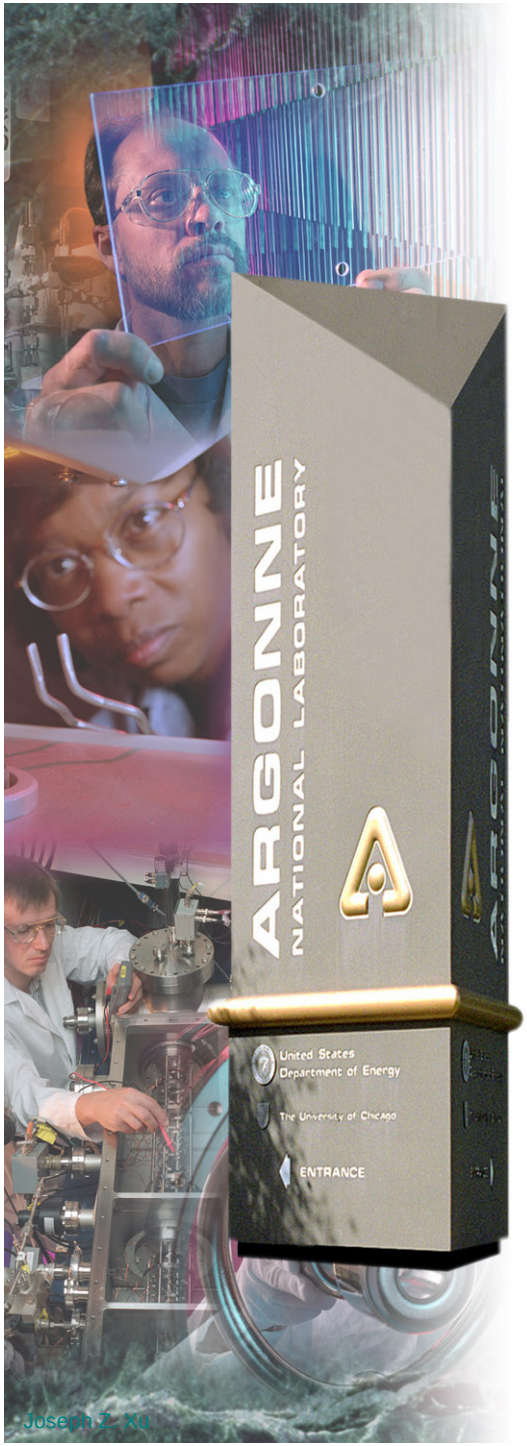
- PVs are "pre-defined" as in the EPICS IOC. They are read from and written to the shared memory from within LabVIEW.

- PVs can be grouped together into interrupt groups to make the operation much more efficient.



What people like

- Supports EPICS like db.
- Faster execution.
- Newer version supports db configuration and IOC initialization.



Shared Memory Issues

Flexibility:

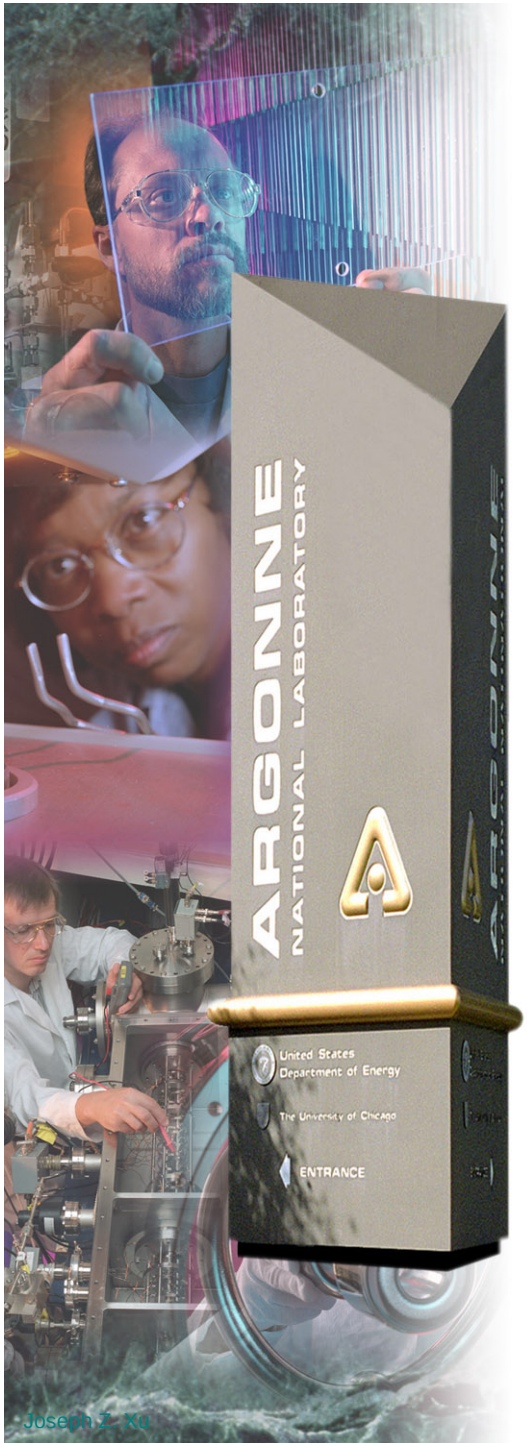
- With Win32 iocCore, all PVs have to be pre-defined. Not as flexible as that of the ActiveX.

Scalability:

- Logic programs (FSM) access DBs via shared memory APIs directly instead of via CAC mechanism.

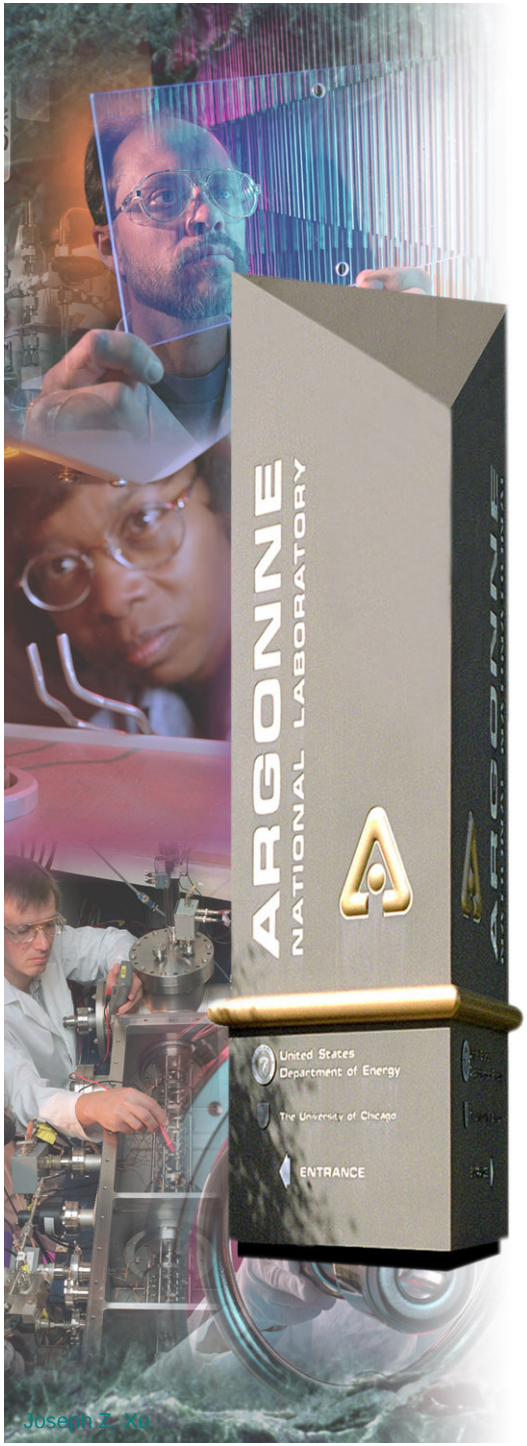
LV to Epics:

- LV doesn't support Callback function.
- LV has different data type format.



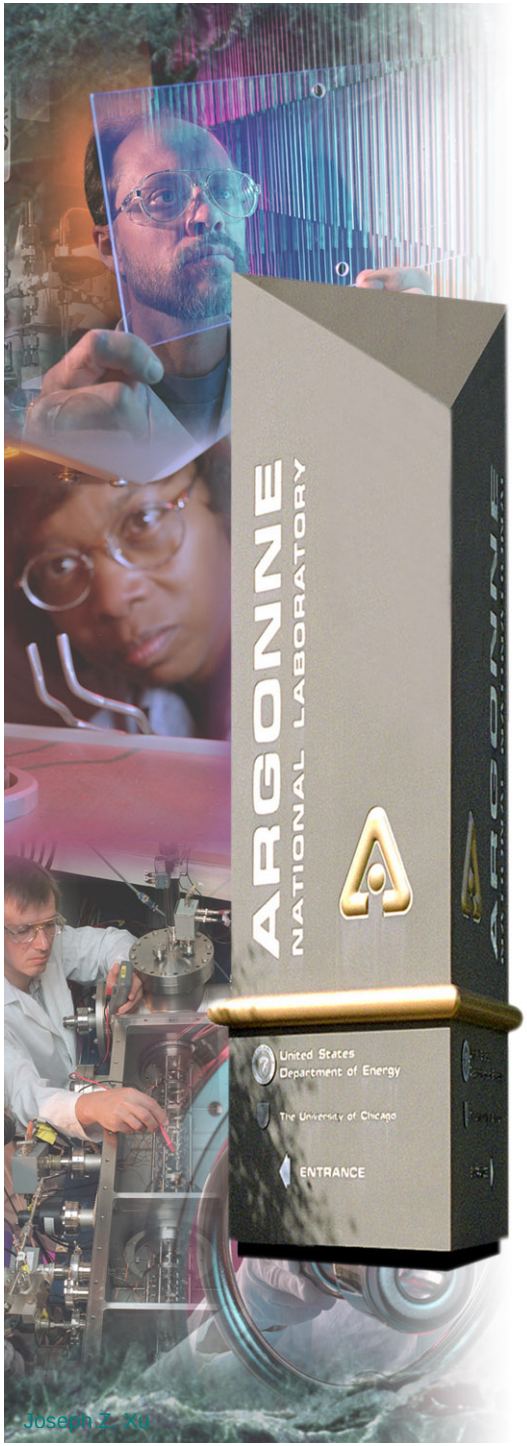
Additional features wanted

- Timestamps
  - Provide event receiver to implement precise timestamps and event driven actions.
  - Comply with EPICS Time Server to sync with other servers.
- I/O event record processing.
- Asynch I/O completion callbacks.
- Others



EPICS-LabVIEW Future

- Both ActiveX and Shared Memory approaches have sufficient advantages to pursue a tighter integration with LabVIEW.
- The functionality of each approach can be enhanced.
- What we want to see "out-of-the-box" from NI?
- Specifications to NI.
- Other issues.



Possible EPICS-LabVIEW Interface

Flexibility:

- CAS/CAC become part of LabVIEW (RT), LabVIEW can "talk" EPICS on Windows, Linux, Unix, RT, and PDA OS's.

Scalability:

- Support modular architecture.
- Will be able to port the existing EPICS like .db format as needed.

LV to Epics:

- Support Callback function.
- Support "C" type data formats.

"A busy and powerful Community…" - Dr. Holger